7984

~~S-E-C-R-E-T~~

60

~~CONFIDENTIAL~~

ST/PC

PROVISIONAL INTELLIGENCE REPORT

MARTI SHIPYARD NO. 444 IN NIKOLAYEV, NIKOLAYEV OBLAST

CIA/RR PR-40

(ORR Project 35.1.1)

9 December 1953

NOTICE

The data and conclusions contained in this report do not necessarily represent the final position of ORR and should be regarded as provisional only and subject to revision. Comments or additional data which may be available to the user are solicited.

WARNING

THIS DOCUMENT CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE LAW, TITLE 18, USC, SECS. 793 AND 794, THE TRANSMISSION OR REVELATION OF WHICH IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.

CENTRAL INTELLIGENCE AGENCY

Office of Research and Reports

~~CONFIDENTIAL~~

~~S-E-C-R-E-T~~

CONTENTS

Appendixes

Tables

Chart

CIA/RR PR-40
(ORR Project 35.1.1)

~~CONFIDENTIAL~~

MARTI SHIPYARD NO. 444 IN NIKOLAYEV, NIKOLAYEV OBLAST*

Summary and Conclusions

The Marti Shipyard No. 444 in Nikolayev, Nikolayev Oblast is the most important shipyard in the Black Sea area and, next to the Baltic Shipyard in Leningrad, the second largest in the USSR.

It has capacity and technological ability to produce all types of naval vessels from small submarines to battleships and to produce merchant vessels from barges to fairly large ocean-going passenger liners. In addition to having good facilities for the building and assembly of ships, the shipyard is equipped with shops which, should conditions demand, could produce most of the ship components, including heavy ordnance and ammunition.

The use of a shipyard's facilities in the Soviet economy is dictated by the national need of the end product. This end product is determined by civilian need or military plan. In post-World War II years, the Marti Shipyard No. 444 has been devoted principally to the construction of naval vessels, as most of the USSR's merchant vessels have been procured from Soviet Bloc and non-Soviet Bloc countries.

Postwar construction of cruisers by the shipyard is believed fairly well established. Little information is available as to the construction of other naval or merchant vessels.

The shipyard's capability to produce cruisers, destroyers, and submarines, using known and probable facilities, but excluding vessel repairs and merchant construction, is estimated at 48,200 standard displacement tons (SDT)** of naval construction annually. Using the same facilities and

* This report contains information available as of August 1953.

** Standard displacement is the displacement (in tons of 2,240 pounds) of the vessel, complete, fully manned, engined, and equipped ready for sea, including all armament and ammunition, equipment, outfit, provisons and fresh water for crew, miscellaneous stores, and implements of every description that are intended to be carried in war, but without fuel or reserve boiler-feed water on board.

~~CONFIDENTIAL~~

excluding vessel repairs and naval construction, the shipyard is capable of producing 82,900 gross registered tons (GRT)* of self-propelled merchant vessels annually.

The production of the Siemens-Martin steel mill and foundry, located within the confines of the shipyard, is of great economic importance. This mill is capable of annually producing 83,800 metric tons of steel. The output is used for castings, forgings, ship and armor plate, and structural shapes.

The location of the shipyard is of strategic importance. It is near many sources of raw materials and has excellent connections to both rail and water transportation. The shipyard is also well screened from the view of ships trading in Nikolayev, as commercial vessels dock downstream about 1 mile.

Electricity is used to a very great extent in the shops and facilities. It is estimated that the shipyard uses about 48 million kilowatt-hours (kwh) per year with a peak load requirement of 12,000 kilowatts (kw). Electric power is obtained from the Nikolayev municipal plant which is connected to the Dnepr - Donets power grid system. Only a small amount of power is produced in the shipyard. Disruption to the power sources would seriously retard shipbuilding and shipyard production in general.

A total shipyard force (direct and indirect)** of 25,500 employees would be required to produce the estimated 48,200 SDT of naval construction; whereas a total shipyard force (direct and indirect) of only 10,875 employees would be required to produce 82,900 GRT of merchant construction.

I. Introduction.

This plant study is one of a series of Soviet shipyard studies. These studies are being made in an effort to better assess the capabilities of the

* Gross registered tonnage is a measure wherein the entire internal cubic capacity of the vessel is expressed in registered tons (100 cubic feet to the ton). Certain items are not included in the measurement such as peak tanks and other tanks of water ballast, open forecastle, bridge and poop, hatchway excess, certain light and air spaces, anchor gear, steering gear, wheelhouse, galley, cabins for passengers, and other minor spares specified by law.

** Direct employees are personnel whose labor is directly chargeable to a specific ship; Indirect employees are personnel engaged in management, clerical work, and maintenance.

Soviet shipbuilding industry and to evaluate the importance of this industry in its interrelation with other industries and the general economy of the USSR.

II. Name and Location.

The Marti Shipyard No. 444, also known as Yard No. 198, Southern imeni Andre Marti, Nikolayev South Shipyard, or as Sudostroitelny i Mekhanicheskiy Zavod imeni Andre Marti, (Shipbuilding and Mechanical Works in Honor of Andre Marti), is situated southwest of the city of Nikolayev, Nikolayev Oblast, Ukraine SSR, in Economic Region* III. The plane coordinates are latitude 46°56'52" N, longitude, 31°58'36" E.

It is located on the north bank of the Bug River, which at this point flows in a west-east direction. The Bug River empties into the Dnepr Bay (Dneprovskiy Liman), an arm of the Black Sea. The shipyard extends along the river for about 1 mile with an inland depth of about 1,300 yards, covering an approximate area of 475 acres.

The shipyard is well situated to receive imports by rail or water. It has several railroad connections with the extensive state railroad system, located to the north of the shipyard. The port of Nikolayev is important for the transshipment of manufactured goods and grain. The 23-mile channel between Dnepr Bay and the port of Nikolayev is reported to range in depth of water from 25 to 30 feet. 1/** It should be noted that the battleship Novorossiysk, which has a maximum draft of 34 feet, 5 inches, and a standard displacement draft of 30 feet, was observed in the Marti Shipyard No. 444. 2/ This channel, in normal winters and with the use of icebreakers during the coldest months, can be kept open to navigation all year.

III. History and Organization.

1. History.

The Marti Shipyard No. 444 was started near the end of the last century (1896-99). 3/ During World War II the German Army overran Nikolayev and occupied the shipyard from the middle of 1941 to the middle of 1944. Just prior to this occupation the Russians evacuated much machinery and many workers to other places in the USSR. Various reports indicate shipments of machinery and equipment to Poti and Batumi, 4/ Gor'kiy, 5/ and to Astrakhan'. 6/

* The term region in this report refers to the economic regions defined and numbered on CIA Map, 12048.1, 9-51 (First Revision, 7-52), USSR: Economic Regions.

** Footnote references in arabic numerals are to sources listed in Appendix C.

Because of the speed of the advancing Germans, the retreating Russians were unable to strip the shipyard completely of equipment and machinery or to do much damage to the buildings and ways.* Upon occupying the shipyard the Germans made minor repairs to facilities and ways and began the construction of small vessels.

When the tide of the war turned and the Russians threatened to retake the shipyard, the Germans methodically demolished 90 percent of the buildings above the ground level. Little damage was done to building foundations or to the shipbuilding ways.

Immediately after Nikolayev was retaken by the Russians in the middle of 1944, reconstruction work began. As original building foundations suffered little damage the pattern of reconstructing the shipyard followed closely the original installations, but practically all the facilities and machinery had to be replaced. Improvements were made in some installations with special emphasis on way No. (2).** 7/ (For location, see the chart*** of the shipyard.)

As only a small part of the removed equipment was brought back to the shipyard, many machine tools necessary for reconstruction had to be allotted by the State Defense Committee from its special reserve and from Lend-Lease deliveries. More than 3,000 machine tools removed from the Desay Alket Plant in Falkensee, Germany, were received in the shipyard. 8/ Many reports state that machinery and equipment used to refit the shipyard are of German, British, and US manufacture. The Russians dismantled the important German submarine construction base of Deschimag at Bremen, acquired as reparations, and shipped the material to Nikolayev. 9/ This material was probably intended for the Marti Shipyard No. 444.

Reconstruction of buildings was done mainly by German, Hungarian, and Rumanian prisoners of war. The installation of machines and equipment was done by Soviet free labor. Only on rare occasions were prisoner-of-war skilled mechanics ever permitted inside a building after equipment and machines were installed and only on rare occasions were prisoners of war used in shipyard production work.

A majority of the reports bearing on reconstruction progress indicate that the shipyard was not completely rebuilt by May 1949.**** Full production in many of the shops was not possible, because of a lack of installed machines and tools.

---

* A way is an inclined structure on which a vessel is built or supported in launching.

** Numbers in parentheses correspond with numbers in circles on the accompanying chart.

*** Inside back cover.

**** Practically all German prisoners of war were removed from the shipyard by this date.

2. Organization.

Before the government reorganization of March 1953 the activities of the shipyard came under the Ministry of the Shipbuilding Industry (MSP -- Ministerstvo sudostroitel'noy promyshlennosti). 10/ During the reorganization this Ministry was combined with the Ministries of Transport, Machine Building, Heavy Machine Building, and Construction and Road Machine Building to form a single Ministry of Transport and Heavy Machine Building. Various reports show that the shipyard is under the direct control of one of the main administrations subordinate to the Ministry. Reports conflict as to which administration has control. Present indications are that the shipyard's principal production will be naval vessels ranging from submarines to cruisers. Merchant vessels may also be constructed in the shipyard.

IV. Importance.

This shipbuilding and repair yard is considered to be the largest Soviet shipyard in the Black Sea area, and its facilities for repairing both naval and merchant vessels are of great importance to the Black Sea Fleet. Next to the Baltic Shipyard in Leningrad, it is the largest shipyard in the entire USSR. 11/

The emphasis placed on reconstructing the shipyard, following World War II, points up the USSR's high evaluation of the strategic importance of this shipyard in the general rehabilitation and future economy of the country. Buildings and facilities reconstructed in the shipyard are of permanent construction 12/ indicating that this shipyard will be integrated into Soviet long-range planning.

It is believed that the shipyard has been reconstructed to assume economic proportions at least equal to that of prewar years. The improvement to way No. (2), 13/ which now makes possible the simultaneous construction within the shipyard of two ships of battleship or carrier size and the installation of facilities for assembly line production of submarines create added value to an already important shipyard.

In addition to its capability for producing large naval warships and merchant vessels, it fills orders from other shipyards and industrial installations throughout the USSR for components and parts.

Within the shipyard, but subordinate to the fabrication and assembly shops, are numerous and extremely diverse shops which could produce nearly all the machines and machine parts needed for the completion of the largest modern warships. 14/

Another factor of considerable economic significance is the Siemens-Martin steel mill within the shipyard. This mill has an estimated annual production of 83,800 metric tons of open-hearth steel.

During the first part of World War II the shipyard, in addition to building ships, was engaged in building naval and coastal ordnance, sea mines, torpedoes, bombs, and ammunition. It is reported that naval ordnance of caliber required to arm heavy cruisers has been made in the shipyard since the war. 15/

V. Buildings and Facilities.

The chart of the shipyard was developed from an enlarged aerial photograph, 16/ and is believed to present a reasonably accurate picture of the shipyard as of May 1949. At that time, many buildings had not been rebuilt, and a number of the reconstructed buildings had not been equipped. This chart has been prepared to show graphically the interrelation of the shipyard's many shops and facilities. A key to the identification of buildings and facilities will be found on the chart.

During the period of reconstruction a single building may have been identified with many different operations. As new buildings were erected and fitted out, an operation which formerly was conducted in an older building was transferred to the new structure. It is to be expected that further shifts will be made as the shipyard is further developed. Very little data on facilities are available, because prisoners of war were rarely permitted inside buildings after the buildings were fitted out for production.

The buildings, way No. (2), railroad and crane tracks, platens, and other construction have been newly built or reconstructed on a permanent basis. Walls of buildings are of masonry, and roofs are made up of precast reinforced concrete slabs covered with asphalt. 17/ Steel columns and steel girders support overhead crane tracks. Foundations for machines are of concrete. 18/

Intra-yard transportation is chiefly by railroad. As can be seen on the chart of the shipyard the shops, shipbuilding ways, and outfitting quays are well served by railroads and cranes. The several connections with the main railroad trunk lines entering Nikolayev make it possible to shunt cars directly into the principal production shops or to quays without transshipment of freight.

The shipyard is protected on the land side by a masonry wall about 10 feet high. All entrances are guarded by armed guards, and entrance is by pass only.

The description of the shipyard's buildings, equipment, and facilities was obtained from many prisoner-of-war 19/ and captured German economic reports. 20/ The equipment is listed as reported, even though it is inadequate to perform the operations indicated by the designated use of the buildings. Although the prisoners of war had very little knowledge of the final installed equipment, it is believed that the designated use of buildings is fairly accurate.

4.* Foundry.

In prewar years, the foundry contained 5 cupola furnaces, a large oil furnace for metal casting, 2 small electric furnaces, several oil-fired reverberatory furnaces, 8 drying furnaces, 1 annealing furnace, a centrifugal casting machine, and an edge runner mill. Postwar reports state that copper, brass, tin, steel, and light metals were alloyed and cast into ingots and that the shop produced brass, bronze, anchors, gear wheels of steel with bronze teeth, parts for stoves and ranges, washing basins of cast metal, and propellers.

8. Machine Shop.

The machine shop contains drill presses, lathes, milling machines, grinders, several large vertical lathes, and a forge. The sections marked b on the chart are served by 24-ton overhead traveling cranes, other sections are served by 60-ton overhead traveling cranes. Section c contains a forge and a number of unknown machines. Section a is a turning shop for rough ship parts and for machining ship propellers. Section e is an assembly shop for ship engines.

9. Machine Shop.

The machine shop contains lathes, grinders, and various machine tools. Section a has large lathes capable of machining propeller shafts up to 40 feet long. Section c is a diesel repair and overhaul shop. All sections are served by 50-ton overhead traveling cranes.

11. Foundry and Forge.

The foundry and forge contains a reverberatory furnace for heating propeller shafts. 10 steam hammers, some of which actually may be forging presses, 3 furnaces, and probably a cupola furnace. The foundry produces propellers, fittings, packing glands, and anchors.

* The identifying numbers for this section correspond to those found on the chart. Certain numbers have been omitted, as nothing is known about the buildings they identify other than their probable use.

14. Dressing Shop.

The dressing shop produces castings and includes a turning shop for small sized parts in iron and brass.

15. Electric Shop.

The electric shop contains an armature-winding department.

16. Machine Repair Shop.

The machine repair shop also contains a turning shop for nuts and bolts.

18. Main Electric Power Plant.

Section a of the main electric power plant is a boiler plant which probably contains 2 or 3 coal-fired boilers. Section b probably contains 2 or 3 turbogenerators. The estimated capacity of the plant is 3,000 kilowatts.

22. Boiler Shop.

The boiler shop contains lathes, drill presses, forge, overhead cranes, and welding machines. The shop produces ship funnels, large boilers, fabricated ship bulkheads, and large pipes.

23. Compressed Air Plant.

The compressed air plant contains two large Siemens turbines.

26. Platens.

Platens are steel-surfaced platforms of concrete used normally for fabrication of subassemblies. The platen east of way No. (1) is elevated with shops underneath. These platens were added during the rebuilding of the shipyard. The size of each is not known. However, a comparison of the area covered by the platens in relation to the size of the shipbuilding ways indicates that the rate of construction of cruisers is not as rapid as reported.

27. Fabrication Shop.*

The hull-fabrication shop contains a table for marking plates, 3 stamping presses for small parts, 6 drill presses for drilling steel plates,

* It is believed that installations indicated on the chart as Nos. 27, 28, 29, 30, and 31 have been combined during the rebuilding of the shipyard to facilitate hull fabrication and are now under one roof. Several reports estimate the size of installation No. 27 to be large enough to include these five installations. The forge listed under installation No. 27 may be the same as that listed under installation No. 31.

1 heavy- and 3 small-plate shears, 1 milling machine, 1 oxyacetylene cutting machine for plates up to 0.75 inche thick, several electric welding machines, plate rolls of an unknown size, several lathes, 2 oil-fired reheating furnaces each 35 feet long, several forges, 3 overhead traveling cranes of 5- to 10-ton capacity, a bending slab, a riveting machine, a welding slab, and pneumatic hammers. A mold loft may be located on the second floor.

30. Electric Power Plant.

The electric power plant contains a small steam turbogenerator with an unknown capacity.

31. Machine Shop and Forge.

The machine shop and forge contains two large furnaces for heating large parts.

33, 34, and 35. Shops for Outfitting and Repair Work.

These shops include a machine and tool shop, an electric repair shop, and a machine assembly shop.

39. Steel Plate Workshop.

The shop contains plate-bending rolls, electric welding machines, and overhead traveling cranes.

40. Woodworking Shop.

The woodworking shop produces patterns and furniture.

42. Copper Pipe Shop.

The copper pipe shop produces copper pipes, copper ship parts, and copper boilers.

69 and 70. Apprentice School.

Apprentices are trained as carpenters, shipfitters, blacksmiths, and lathe operators.

71. Forge.

The forge contains 6 furnaces and 4 or 5 forging hammers or presses.

80. Submarine Fabrication and Assembly Plant (Zeche* 32).

This plant was partially equipped as of May 1949. In early 1949, section a and the west end of section c were producing cylindrical sections which are reported to resemble pressure hull sections of submarines. Little equipment was installed in section b and in the eastern end of section c. The western end apparently is being equipped to shape and fabricate hull sections. There is no indication in available data as to the possible use of section b and the east end of section c. Several reports state that launching ways were planned for installation between the east end of section c and the outfitting basin which is about 170 feet away. Available information states that the several sections are equipped as follows:

Section a contains punch presses, 4 overhead cranes of 10-ton capacity, a hydraulic bending machine, an oxyacetylene cutting machine, automatic electric welding machines for welding cylindrical sections, 6 or 7 plate shears, a lathe 33 feet long, assembly platforms, transformers, and numerous gas and electric welding machines.

Section b contains several overhead cranes.

Section c contains seven or more platforms located in the western end. Five platforms are about 40 feet by 75 feet by 3 feet high and 2, about 40 feet by 40 feet by 3 feet high, having rails on top embedded in concrete, some of which form an egg-crate pattern. The western end also contains a vertical lathe (or boring mill) with a turntable reported to be from 14 to 20 feet in diameter; a long horizontal lathe; 2 overhead traveling cranes of 10- and 25-ton capacity; and automatic welding machines. Two overhead traveling cranes of 25- and 50-ton capacity respectively, travel the entire length of section c. Prior to reconstructing this shop there were several open cylindrical concrete pits, estimated to be about 40 feet in diameter by 35 feet deep, in both the eastern and western ends. These pits were probably used as hydrostatic test basins. Several reports state that the pits in the western end were filled in and floored over whereas those in the eastern end remained unchanged. Other reports state that the pits in the eastern end also were floored over. As little work was done in the eastern end by May 1949, the condition of these pits is unknown; however, indications are that they will be floored over similar to those in the western end.

Section d is a platform located in the open between section a and section b containing 2 plate rolls and heavy plate cutting shears.

Section e contains transformers and air compressors.

Sections f and g contain offices and small shops.

* Zeche is the German word for corporation. The name is given here because the plant is referred to as Zeche 32 in many intelligence documents.

83, 89, and 90. Precast Reinforced Concrete Plants.

These plants produced roof and floor slabs during the reconstruction of the shipyard. It is unlikely that more than one plant will continue the manufacture of precast slabs.

92, 93, 94, 95, 96, and 97. Machine Shops.

Little is known about these machine shops. Strict security was drawn around the shops when prisoners of war were employed in the shipyard. Prior to World War II these shops produced ordnance, ammunition, mines, and torpedoes.

103. Siemens-Martin Steel Mill.

In 1935, the Siemens-Martin steel mill had 3 open-hearth oil-fired furnaces in operation which totaled about 648 square feet of hearth area divided into furnace No. 1, 78 square feet; furnace No. 2, 216 square feet; and furnace No. 3, 354 square feet. It has been reported that three open-hearth oil-fired furnaces have been rebuilt since the war and it is assumed they have been rebuilt to their prewar size. Space is available in the plant for a fourth furnace, and several reports indicate that a fourth furnace was planned. In 1935, 2 Bessemer converters were in operation having a total capacity of 5.4 metric tons. Postwar reports state that three Bessemer converters of unknown capacity are in operation. Electric furnaces were in operation before and after World War II. The steel mill produces ingot steel and large castings including ship anchors. One rolling mill to produce ship plate was reported installed and a second one planned.

107. Casting, Dressing, and Welding Shop.

This shop is used in conjunction with the Siemens-Martin steel mill. In prewar years the shop was equipped with 2 large and 2 small annealing and normalizing furnaces for castings.

114. Telephone Exchange.

The telephone exchange contains a Siemens-Halske automatic exchange system of 300 24-volt extensions and 1,200 60-volt extensions.

120. Turbine Plant.

The turbine plant produced marine turbines prior to World War II. Postwar reports do not show that this installation has been refitted to produce turbines.

The dimensions used in the description of the following facilities, (1) through (10), were derived from photo interpretation analysis of 1944 German aerial photography of the shipyard.

(1) Large Shipbuilding Way.

The estimated dry length is 900 feet* but the cofferdam extension may extend the dry length to 1,064 feet. The inland end of the way contains shops. Estimates of height above grade of the inland end vary from 13 feet to 50 feet. Using a declivity of five-eighths of an inch to 1 foot and assuming the grade at the inland end to be about 10 feet above water level, it is believed that the inland height above grade is about 38 feet.

(2) Large Shipbuilding Way.

The estimated dry length of way No. (2) is 820 feet. With a possible cofferdam extension, the dry length may be extended to about 985 feet. The inland end contains shops. Estimates of height above grade of the inland end vary from 25 feet to 50 feet. Using the methodology employed in estimating the height of way No. (1), the inland height above grade would be about 33 feet.

(3) and (4) Shipbuilding Ways.

The estimated length of these ways is 425 feet.** The ways are inclined and formerly were covered. It is believed that ship material used in construction on these ways is picked up by high overhead traveling cranes from an area lying between the north end of the inclined ways and fabrication shop No. 27. Ship material is probably moved from the fabrication shop to this pick-up area by means of flat cars or small mobile cranes. It is estimated that this pick-up area is approximately 47 feet wide and runs in length the full width of the building. The building housing these ways is 472 feet long. Deducting 47 feet from this dimension leaves 425 feet, which is considered to be the length of the shipbuilding way.

(5), (6), and (7) Shipbuilding Ways.

The estimated length of these 3 ways is 375 feet.*** The inland end of the ways is estimated to be about 20 feet above grade and the ways are estimated to have a declivity of three-fourths of an inch to 1 foot.

(8) and (9) Outfitting and Repair Basins.

The depth of water in the basins is not known. Reports state that the ship Novorossiysk, which has a ma imum draft of 34 feet, 5 inches, has been observed in the larger basin. The two wet basins in the shipyard

* ONI estimates the dry length of the way at 820 feet.
** ONI estimates the length of the ways at 460 feet.
*** ONI estimates the length of the ways at 446 feet.

are used for outfitting and for repairs. The larger basin is about 765 feet by 1,100 feet and the smaller basin is about 130 feet by 460 feet. About 2,550 linear feet of quay side is served by railroad tracks from which mobile cranes could operate.

(10) Probable Side Launching Ways.

The estimated length of these ways is 1,000 feet.

(11) Probable Submarine Launching Way.

This way is used for submarines from the submarine fabrication and assembly plant (Zeche 32). The construction of this way is unconfirmed. The original reports may have referred to planned rather than to actual construction.

Eight mobile tower hammerhead cranes serve way No. (1) and way No. (2). Estimates of size range in height from 82 feet to 196 feet and estimates of the working radius range from 49 feet to 131 feet. It is believed that these cranes are large, that they probably clear 115 feet under the jib with a working radius of 95 feet, and are capable of lifting 30 metric tons near crane and 10 metric tons at end.

Prior to World War II, way No. (3) and way No. (4) were serviced by overhead traveling cranes. These cranes, together with the supporting structure, were destroyed by the retreating Germans. Considering the limited space available on each side of these ways, it is believed that, in the rebuilding of the shipyard, similar cranes were erected.

Cranes serving other ways, quays, shops, and in general use in the shipyard are of the mobile locomotive type.

Two floating docks 21/ and 2 floating cranes 22/ are available to serve the port and the shipyards in Nikolayev. The larger dock is 558 feet long over-all by 136 feet wide inside and can be submerged to obtain a 30-foot depth of water over the keel blocks. This dock has a lifting capacity of 30,000 metric tons. 23/ The smaller dock is reported to be about 165 feet long. 24/ The 2 floating cranes are of 150-metric-ton and 60-metric-ton lifting capacities. 25/

VI. Production.

Since, with few exceptions, the shipyard has been reconstructed along its former lines, it may be assumed that production has been resumed along prewar lines modified to suit postwar plans.

1. Pre-World War II.

The shipyard has had almost continuing experience in naval construction since the days of the tsars. 26/ It has produced battleships, cruisers, submarines, destroyers, motor torpedo boats, and icebreakers. 27/

In prewar years the Marti Shipyard No. 444 specialized in the production of merchant vessels such as medium-sized lumber carriers, large tankers, and icebreakers. 28/

Just before World War II the shipyard was engaged in the construction of the battleship Krasnaya Ukraine. 29/ This battleship was similar in size to the Sovyetsky Soyus class, which was estimated at 794 feet long, 119 feet in breadth, and of 35,000-metric-ton standard displacement. 30/ The Krasnaya Ukraine was practically completed when the Germans occupied the shipyard in 1941. However, completion was not undertaken by the Russians after the war, and the vessel was finally cut up. The dismantling was completed in early 1949.

In prewar years the shipyard contained an almost independent railroad-car-manufacturing plant and an engine-building plant, which produced steam turbines and large reciprocating engines. 31/

Production in the various shops indicates a wide range of commodities for both shipbuilding and industrial application. Various reports state that the shipyard produced stationary and marine boilers, marine diesel engines, cast steel and iron, forgings, general machinery, metal construction, shapers, jacks, cast bronze, 32/ steam turbines and crankshafts, 33/ and small turbogenerators up to 5,000 kilowatts. 34/

The monthly production of ordnance and ammunition in 1938 is shown in Table 1.*

The production of the Siemens-Martin steel mill was used chiefly for forgings, axle steel, tubing billets, and shaped castings as shown in Table 2.** 35/ The reported total annual production of the open-hearth furnaces varies from 70,000 metric tons 36/ to 82,800 metric tons. 37/

* Table 1 follows on p.15.
** Table 2 follows on p.15.

Table 1

Monthly Production of Ordnance and Ammunition
in Marti Shipyard No. 444
1938

Item	Number	Size
Guns		
Antiaircraft	12 units	3 inches
Coastal	8 units	6 inches
Coastal	1 unit	16 inches
Ammunition		
Antiaircraft	13,000 rounds	3 inches
Coastal	10,000 rounds	6 inches
Coastal	2,000 rounds	12 to 16 inches
Bombs	2,500 units	110 to 1,100 pounds
Sea Mines	1,250 units	
Torpedoes	100 units	

The production of the Siemens-Martin steel mill was apportioned in 1938 for the uses shown in Table 2. 39/

Table 2

Apportioned Production of the
Siemens-Martin Steel Mill
1938

Metric Tons

Use	Total Amount
Forgings	18,000
Axle Steel	6,000
Tubing Billets	36,000
Shaped Castings	10,000
Total	70,000

Of this production the shipyard consumed about 10 percent of the forgings and shaped castings. The tubing billets were shipped to Leningrad, Izhevsk, and Taganrog; the remainder of the forgings were shipped to Leningrad. The steel castings were shipped to other shipyards of the USSR, particularly to Leningrad and even to Vladivostok. 40/

Contained within the Siemens-Martin steel mill was a large steel-casting department. Adjacent to the steel mill, on the east, was a large dressing and electric welding shop for castings. The dressing department contained several large reheating furnaces for normalizing and for the heat treatment of the rough castings. Castings ranging in size up to 60 metric tons in single pieces were produced. The monthly prewar production was 800 metric tons. Among the items produced were ship's fittings, anchors, stern posts, steering frames, rudders, propellers, bearing brackets, shaft heads, turbine parts (stator), and railroad car parts. 41/

2. Postwar.

Specific reports covering completion of shipyard facilities and of postwar production are not available. For example, the large turbine shop that was known to exist before World War II has not been reported as being again in production.

Various reports indicate that the shops within the shipyard are capable of producing many components of vessels. From an economic point of view, it is believed that the shops would not engage in any production that paralleled that of the specialized industries. In prewar years the cost of metal articles produced in Marti Shipyard No. 444 were 47.3 percent higher than any similar article produced by specialized industries elsewhere in the USSR. 42/ It follows either that the shipyard's shops would not produce items that could be manufactured by specialized industries unless such industries were overloaded with orders and the product could not be obtained outside the USSR or that transportation difficulties made it necessary to produce the item in the shipyard's shops. It is believed that using the shops in assembly work and production of items for which the demand is not sufficient to devote a single industry or shop to continuous production best serves the Soviet economy.

Probably the most important postwar contribution of the shipyard to the Soviet naval forces has been the completion of two cruisers, whose construction was interrupted by World War II, and the additional construction of new cruisers. These cruisers, the Kuybyshev and the Frunze, which were towed away from the shipyard in a partially completed state just prior to the German occupation of the shipyard, were returned to the shipyard for completion and are now believed to be in operation with the Black Sea Fleet. 43/

Following the dismantling of the battleship Krasnaya Ukraine, the keel of a large vessel was laid down in way No. (1) in January 1949. In May

1949 a similar keel was laid in way No. (2). 44/ These were the first large vessel keels laid after World War II. Two or more warships of cruiser size have been reported several times between January and August 1951 as being alongside in the fitting-out basin. 45/ Two hulls have been reported as occupying the 2 large ways. 46/ It is probable that the first hulls were launched in May and September 1950 and that new vessels were laid down immediately. 47/

It is believed that the new vessels are light cruisers of the Chapayev or Sverdlov class. The probability that they are of the Sverdlov class appears greater as the Sverdlov is a postwar design and currently being built in the Leningrad shipyards. 48/ Construction of Sverdlov cruisers in Leningrad requires about 14 months on building ways and about 13 months for outfitting. 49/ Estimating that the Marti Shipyard No. 444 required 2 extra months for building and 2 extra months for outfitting, 50/ a probable construction schedule would be as follows:

	Keel Laying	Launching	Delivery
Vessel 1, Way No. (1)	January 1949	May 1950	August 1951
Vessel 2, Way No. (2)	May 1949	September 1950	December 1951
Vessel 3, Way No. (1)	July 1950	November 1951	February 1953
Vessel 4, Way No. (2)	November 1950	March 1952	June 1953

Considering that a cruiser is on the ways for 16 months and that 2 months are required after launching to prepare the ways for the laying of a new keel, cruiser launchings may be scheduled every 18 months. Assuming that outfitting requires an additional 15 months and that it can be done in the shipyard simultaneously with the construction of a new hull on the ways, the production rate of completed cruisers for 1 way may be scheduled at 1 every 18 months. As 2 ways are used for cruiser construction, the shipyard's production rate would be 1 cruiser every 9 months.

In the reconstruction of the shipyard, special attention was paid to the fitting-out of the submarine fabrication and assembly shop, which purportedly will fabricate and assemble submarines on the assembly line production method. By May 1949, production had already begun in the fabrication of cylindrical sections which resembled pressure hull sections of a submarine. 51/ These sections were shipped outside the shipyard to destinations unknown. 52/ In December 1950, on the Bug River and in the vicinity of the shipyard there were observed a number of submarines with high conning towers, believed to be new and on builders' trials. 53/ This observation may confirm that actual submarine production has begun.

Several reports state that in 1948 and 1949 a number of small craft were probably built on ways Nos. (5), (6), and (7), 54/ and ranged, in types of vessels reported, from barges and small naval craft to boats for inland waterways. Estimates of length range from 82 feet to 182 feet.

With the exception of the foregoing probable construction, the available reports indicate no merchant vessels of any size under construction.

Several reports indicate that an aircraft carrier is possibly under construction in the shipyard. 55/ These reports have not been confirmed.

The productivity of the Siemens-Martin steel mill and foundry contributes greatly toward satisfying the shipyard's steel requirements for castings, forgings, plates, and shapes. It is probable that the Siemens-Martin steel mill produces all of the steel required for hull construction. Information about various facilities within the reconstructed mill tends to support the assumption that, in addition to producing casting metal, the mill also produces steel of ship plate quality. 56/ This assumption, coupled with expanded ship construction facilities, would point toward the use, in postwar years, of a higher percentage of the steel mill's output for shipbuilding.

Various data show that Siemens-Martin furnaces not connected directly with large metallugical installations in the USSR differ considerably as regards the number of melts carried out in a working period, the amount of cold overhauls a year, and the time idle. A standard of 5 overhauls per year, each taking 10 days, may be adopted as a reasonable average. Allowing 6 days for holidays, this would mean that the furnaces were in operation 310 days of the year. 57/ Using the production factor of 0.418 metric tons per square foot per day of operation, 58/ and a total hearth area of 648 square feet the annual production would amount to 83,838 metric tons. Because the Russians, in their Fifth Five Year Plan (1951-55), have placed great emphasis on steel production and because this mill was one of the first units to be rebuilt, it is believed that postwar annual production of raw steel would not be less than 83,800 metric tons.

The electric furnaces add greatly to the economic importance of the steel mill. Steel of the quality required for armor plate and possibly high-speed tool steel can be produced because the electric process permits close control of the composition of finished steel.

A rolling mill for the production of ship plate connected with the steel mill has been reported. 59/ A second rolling mill for the production of ship plate is also planned. 60/

Some of the steel produced in the Siemens-Martin steel mill was shipped to the Northern Yard in Nikolayev. 61/

Postwar reports up to May 1949 indicate production of naval ordnance, 62/ propeller shafts, propellers and crankshafts, 63/ armor plate, 64/ ship funnels, and large boilers. 65/

VII. Capabilities.

Upon considering the capability of the shipyard to produce ships it is assumed that the shipbuilding facilities will probably be used to their fullest extent for building naval vessels, with particular emphasis on producing vessels for the Black Sea Fleet. This shipyard is capable of and has the capacity for building all types of naval vessels from the smallest type of submarine to battlehips or carriers and for building all types of merchant vessels from barges to fairly large ocean-going passenger liners.

In assessing the shipyard's capability to produce vessels larger than the Sverdlov cruisers, reference is made to the prewar partially completed battleship, the Krasnaya Ukraine. 66/ This vessel was originally scheduled to be launched in 1941, but in 1940 it was reduced in priority, and construction work practically ceased. After World War II the vessel was cut up on the ways.

Based on known postwar construction in the USSR, the following arbitrarily selected naval vessels may simultaneously be built in the Marti Shipyard No. 444 as shown in Table 3.

Table 3

Estimated Naval Vessel Construction Capacity

		Possible Construction		
Way Number	Naval Vessels	Over-All Length (Feet)	Tonnage (SDT)	Class
(1)	1 Cruiser	720	16,000	Sverdlov
(2)	1 Cruiser	720	16,000	Sverdlov
(3)	1 Destroyer	410	3,000	Model 0
(4)	1 Destroyer	410	3,000	Model 0
(5)	1 Submarine	308	1,480	K
(6)	1 Submarine	308	1,480	K
(7)	1 Submarine	308	1,480	K
(10)	5 Submarines	192	587	Shch
Building No. 80	8 Submarines	192	587	Shch

Although confirmation of complete rehabilitation of all prewar shipbuilding ways is lacking, it is believed that the shipbuilding ways listed above would be made serviceable should the program demand.

The possible annual production in naval standard displacement tonnage (SDT) is estimated in Table 4.

Table 4

Estimated Naval Vessel Annual Production Capacity

Number of Vessels	Class	Tonnage (SDT)
1.6 Cruisers	Sverdlov	25,600
2.2 Destroyers	Model O	6,545
4.0 Submarines	K	5,920
17.3 Submarines	Shch	10,174
Total		48,239 a/

a. ONI estimates 57,200 SDT not including production from the side launching ways.

In computing the annual production, three assumptions were made.

(1) The necessary materials, labor, and power would be available.

(2) Only one main labor shift would be employed.

(3) Way time is considered to be the limiting factor of the production rate. The cruiser construction rate was taken at 15 months of way time, destroyers at 11 months of way time, and large (K) submarines at 9 months of way time. The way time includes 1 month in which to prepare the way for the next keel laying. For these vessels it is assumed that approximately an equal amount of time will be required in outfitting. In this case all of the quay sides, now served by railroads, would be tied up in outfitting the cruisers, destroyers, and large submarines. The way time for the smaller submarines (Shch) was taken at 9 months. Because of lack of outfitting space it was assumed that the smaller submarines would be essentially completed on the ways. In this connection several reports show that a launching way was planned for the east end of the submarine fabrication plant No. 80. Although actual construction of this launching way has not been confirmed, it is believed that some method will be employed for launching completed submarines directly from this plant either as reported or through the large door in the south side near the eastern end.

In the event that the shipyard should be devoted to the production of merchant vessels, the self-propelled cargo ships shown in Table 5 could simultaneously be built.

Table 5

Estimated Merchant Vessel Construction Capacity

	Possible Construction		
Way Number	Number of Vessels	Over-All Length (Feet)	Tonnage (GRT)
(1) a/	1	465	6,750
	1	300	2,150
(2) a/	1	465	6,750
	1	300	2,150
(3)	1	425	5,000
(4)	1	425	5,000
(5)	1	375	3,650
(6)	1	375	3,650
(7)	1	375	3,650
(10)	3	300	2,150

a. As these ways were over 800 feet long a combination of 2 vessels on each way was used. The construction time of the shorter vessel being one-half the larger permitting the launching of the larger immediately following the launching of the second vessel.

On the above basis of merchant construction the possible annual production in gross registered tons is estimated in Table 6.

Table 6

Estimated Merchant Vessel Annual Production Capacity

Number of Vessels	Over-All Length (Feet)	Tonnage (GRT)
2.7	465	18,000
13.3	300	28,665
3.2	425	16,000
5.5	375	20,214
Total		82,879 a/

a. ONI estimates 64,600 GRT.

The assumptions made in calculating merchant tonnage were similar to the assumptions made for the calculation of naval tonnage.

(1) The necessary material, labor, and power would be available.

(2) Only one main labor shift would be employed.

Way time for the 465-foot vessels was taken at 9 months; for 300-foot vessels at 4-1/2 months; for 425-foot vessels at 7-1/2 months; and for 375-foot vessels at 6-1/2 months. Estimating that outfitting could be done in one-half the amount of way time, continuous production could be based on way time.

No merchant vessels were assumed to be built in the submarine fabrication and repair plant No. 80.

Output in both naval and merchant tonnage would undoubtedly be greater if the number of working hours of the one shift or the number of labor shifts were increased. Output also would be increased by repetitious production of a single design.

Production of vessels at the foregoing rate would seriously restrict the shipyard's capability for repair work. All of the quay sides, now served by railroads, would be tied up in the outfitting of newly built vessels.

Repair work is limited by the lack of adequate dry docking facilities. Only 2 floating dry docks, 1 large and 1 small, are available to the shipyard. There are no graving docks* or marine railways among the shipyard's facilities.

As mentioned earlier in this report, the several production shops within the shipyard could, if necessary, produce many military items including heavy ordnance and ammunition.

VIII. Labor.

Reports vary considerably as to the total number of shipyard employees. A 1937 report gives a total of 26,000 employees, 67/ whereas 2 postwar estimates (1950) give 15,000 employees, 68/ and 21,000 employees respectively. 69/ Considering the progress made in reconstructing the shipyard, it is doubtful that the shipyard was fully rebuilt and equipped at the time of the postwar estimates which may account for the lower figures.

A direct (productive) labor force of 15,300 employees is required to produce the estimated 48,200 SDT of naval construction on a one-shift basis. Assuming that the direct force is 60 percent of total employment, direct and indirect, the total shipyard force required would be 25,500.

* "A graving dock is a stationary basin constructed partially below normal water level, open at one end, through which a vessel is floated. This open end is then closed by a watertight gate and the basin drained, thereby facilitating underwater repair."

In calculating the number of direct employees, the figures in Table 7 showing the number of US man-hours required to construct certain types of naval vessels were used. 70/

Table 7

US Man-Hours Required to Construct Naval Vessels

Type of Vessel	Tonnage (SDT)	Total Man-Hours per Vessel	Man-Hours per SDT
Cruiser	15,000	7,400,000	493
Destroyer	2,600	2,160,000	830
Submarine	1,480	1,400,000	945
Submarine	587	600,000	1,022

It is assumed that the productivity of the Soviet shipyard worker is comparable to that of the US shipyard worker. Therefore, no factor of relative efficiency was used.

The working year (man-year) in the USSR is probably 2,224 working hours; that is, 365 days minus 87 days, which includes regular days off, holidays, absenteeism, and vacations, leaving 278 days; 278 days at 8 hours per day equaling 2,224 man-hours. On this basis the direct labor required by the Marti Shipyard No. 444 to yield the possible production of 48,239 SDT of naval construction is shown in Table 8.

Table 8

Estimated Number of Direct Employees
Required to Construct Soviet Naval Vessels

Type of Vessel	Tonnage (SDT)	Direct Employees
Cruiser	25,600	5,674
Destroyer	6,545	2,442
Submarine (K)	5,920	2,515
Submarine (Shch)	10,174	4,675
Total	48,239	15,306

In estimating the man-hours required to construct the merchant tonnage, a US factor of 175 man-hours required to produce 1 GRT of cargo ship construction was used. This factor may be reduced to 115 man-hours per ton for repetitious production after the 20th vessel. Since the estimate of merchant tonnage is based on cargo-class vessels, only one rate was used. Therefore, on a one-shift basis the man-hours to produce 82,900 GRT at 175 man-hours per GRT and a 2,224-hour man-year would be 6,525 direct employees. The total shipyard force, direct and indirect, would be 10,875 employees.

No estimate is made of the number of employees engaged in productive work other than that for shipbuilding. The foregoing labor estimates do not include the workers in the Siemens-Martin steel mill or in shops engaged in production of components for shipyards elsewhere in the USSR or for other industrial consumers.

A school for apprentices has been in operation in the shipyard since the end of World War II. 71/ The number of apprentices is not known.

IX. Sources of Power and Materials.

1. Power.

Following the rebuilding of the shipyard, most of the new installations are powered by electricity. Electric welding is used extensively in the fabrication and assembly of ships and in other production shops in the shipyard. There are several electric smelting furnaces in the shipyard. The Marti Shipyard No. 444 is, therefore, one of the largest consumers of electric power in Nikolayev. 72/

Electric power is supplied to the shipyard chiefly from the Nikolayev municipal power plant 73/ which generates about 67,000 kw. 74/ Another source of power is a small power plant within the shipyard probably generating between 2,250 kw and 3,000 kw. This small plant, which produced 2,250 kw 75/ prior to World War II, was not expanded when rebuilt following the war although it is possible that equipment installed after the war may have increased its output. The municipal power plant is tied in with the Dnepr - Donets power grid system. The grid system total power supply, estimated as of 1950, is 2,223,000 kw. 76/ The total coincident peak load plus 10 percent for reserves is 2,031,000 kw, leaving an excess of available power of 192,000 kw or 8.6 percent of total available power. 77/ This power study assumed an annual consumption of 48,000,000 kwh with a coincident peak load of 12,000 kw for the Marti Shipyard No. 444. 78/

Damage to the municipal plant would not seriously affect the shipyard as power would be supplied by the grid system. Damage to both the power grid and the municipal plant would seriously reduce production. Damage to the municipal and shipyard generating plants and to the power grid would virtually halt production in the shipyard.

2. Raw Materials.

The principal raw materials required for production are available through relatively short hauls by rail or water.

In prewar years, unknown amounts of raw materials for the shipyard's smelting and casting plants were obtained from the following sources 79/:

a. Iron ore for the Siemens-Martin steel mill from Krivoy Rog.

b. Chromium ores from the Urals. They were reduced directly from slag in a steel bath.

c. Lime from Sebino (on the Bug River).

d. Dolomite from Dolomit in the Donets Basin.

e. Bauxite from Tikhvin, near Leningrad.

f. Fluorspar from Khodobulaki.

g. Dinas and Chamotte bricks, chiefly from the Donets Basin.

h. Magnesite and chromium magnesite bricks from Sadka in the Urals.

i. Coal from the Donets Basin, party by rail and partly by boat via Zhdanov.

j. Coke for cupola furnaces and for bending of copper tubing from the Donets Basin.

k. Mazut (fuel oil) from Kherson and Tuapse. (The supply source for fuel oil has probably changed since the war with the opening of the Volga-Don Canal.)

l. Pig iron (steel pig from the Donets Basin). Analysis: 0.8 to 1.4 percent silicon, 2.6 percent manganese, 0.10 to 0.14 percent phosphorus, 0.02 to 0.05 percent sulfur.

m. Scrap metal from the shipyard's own volume of scrap and from the southern Ukrainian scrap area (Nizhnedneprovsk scrap base).

n. Foundry pig iron from the Ukraine.

o. Ferroalloys from the Zaporozh'ye ferroalloy plant.

p. Nonferrous metals (copper, nickel, zinc, and tin) were obtained to a considerable extent through imports, but in part also from Soviet production.

APPENDIX A

METHODOLOGY

The main body of this report was compiled chiefly from postwar intelligence and 1944 aerial photography. Prewar production reports were used to indicate postwar potentialities, assuming that the shipyard was reconstructed to at least duplicate prewar capabilities.

The designation of building and shop use and the description of facilities is a digest of the many postwar reports contained in the consolidated plant folder in the Industrial Register.

The layout of the shipyard was made from the same consolidation, but using enlarged aerial photographs to fix the position of installations.

Explanations of the methodology used to estimate the shipyard's capability to produce naval and merchant vessels and the rate of production are contained in the text.

APPENDIX B

GAPS IN INTELLIGENCE

Information on plant reconstruction since World War II is very poor, and data on current production are practically nonexistent.

The high sensitivity of the shipyard's production in the Soviet naval program caused rigid security measures to be invoked during the reconstruction period.

Little is known about the actual machinery and equipment inside shops. The use of buildings and the technology employed in production can only be deduced from vague references and limited data.

Although this report contains information up to August 1953, no information is available as to development within the shipyard after mid-1949.

The major gaps are those pertaining to the development of buildings, equipment, and facilities since mid-1949; sources of raw, semifinished, and finished material; destinations of products; production, availability and skill of manpower, budgets; and technological process.

APPENDIX C

SOURCES AND EVALUATION OF SOURCES

1. Evaluation of Sources.

The compilation of data and the preparation of estimates and conclusions were derived from Industrial Register, CIA Library, Graphics Register, and discussions held with other IAC members.

The numerous documents reviewed in the Industrial Register were mainly prisoner-of-war reports. Most of the reporting prisoners of war were untrained observers and nontechnical men. A few were skilled mechanics. The reliability of single reports could be evaluated only on their contributions to the study as a whole. The composite of selected reports may be given a rating of possibly true.

The documents reviewed in the CIA Library were additional prisoner-of-war reports, publications by IAC agencies, naval attaché reports, and a few foreign government intelligence reports and digests. The prisoner-of-war reports should be rated the same as those reviewed in the Industrial Register, possibly true. The remainder of the documents, reviewed in the CIA Library, has been given a high evaluation as they represent the considered opinion of experienced observers and analysts.

The Graphics Register gave valuable aid in obtaining aerial and land photos from which the location of the shipyard and installations could be determined.

2. Sources.

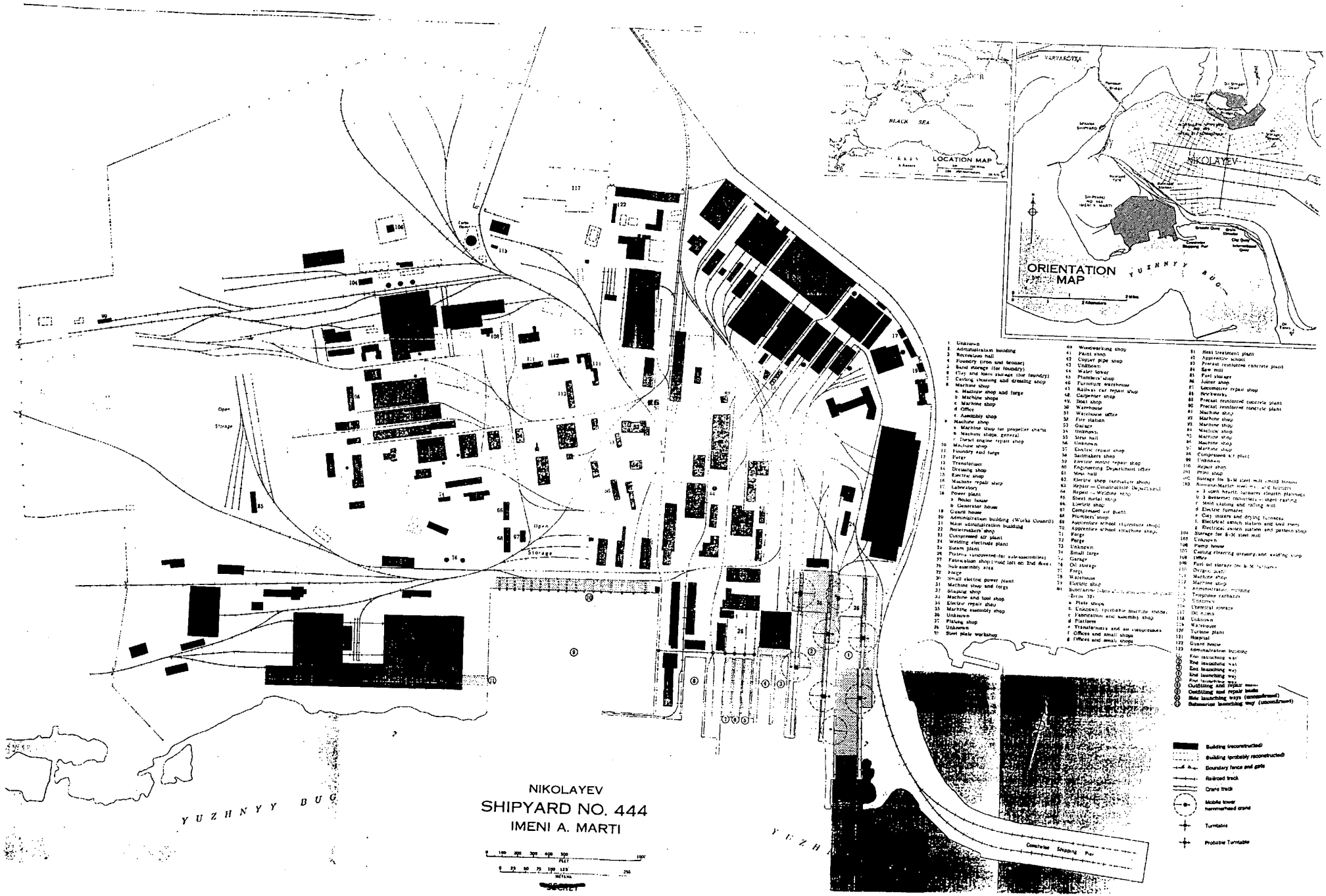
Evaluations, following the classification entry and designated "Eval.," have the following significance:

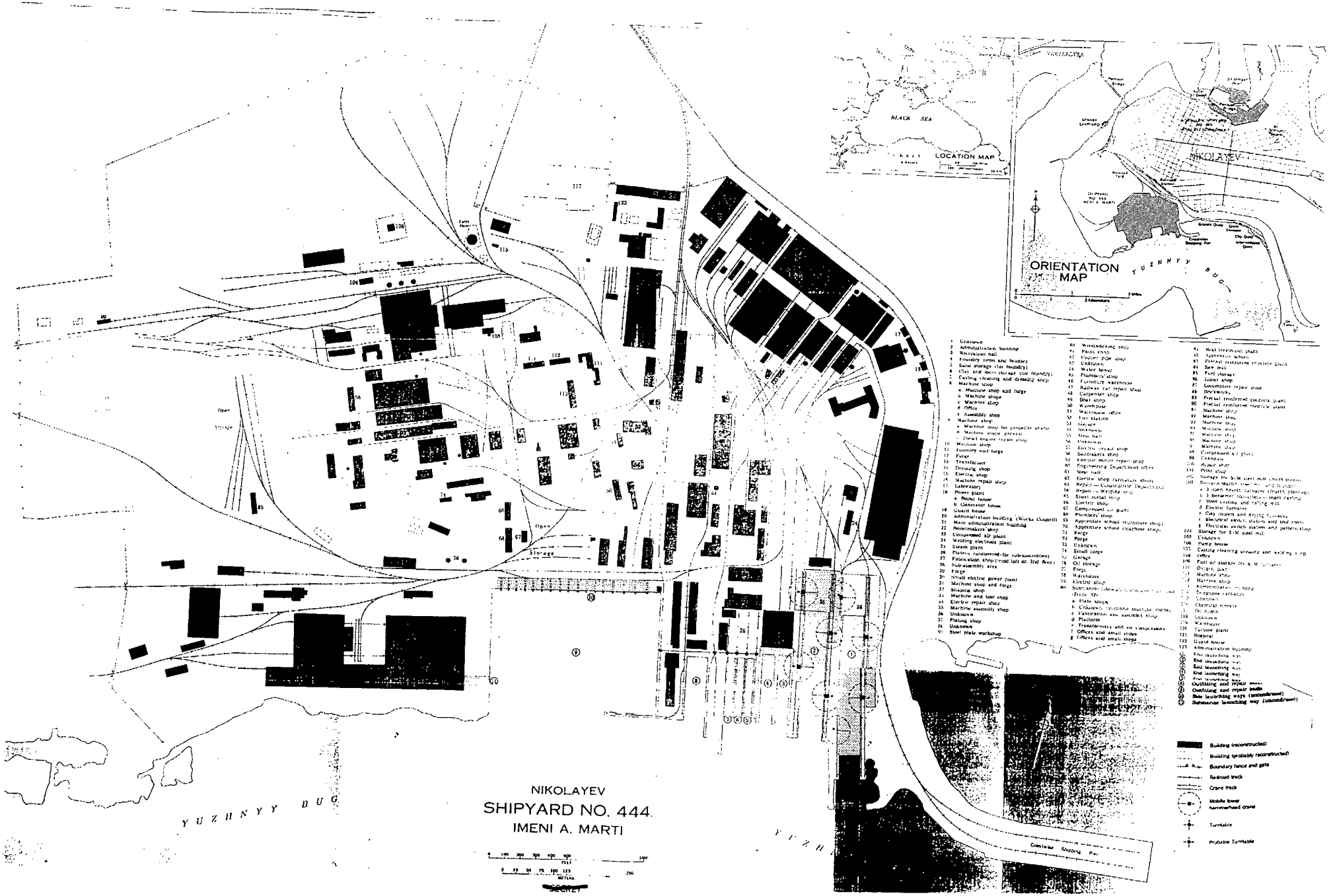
A - Completely reliable	1 - Confirmed by other sources
B - Usually reliable	2 - Probably true
C - Fairly reliable	3 - Possibly true
D - Not usually reliable	4 - Doubtful
E - Not reliable	5 - Probably false
F - Cannot be judged	6 - Cannot be judged

Evaluations not otherwise designated are those appearing on the cited document; those designated "RR" are by the author of this report. No "RR" evaluation is given when the author does not disagree with the evaluation on the cited document.

1. NIS 26, Section 35. S. Eval. RR 2.
2. Comnavforger 55-S-50, 16 Feb 1950. S. Eval. B-2.
3. S.P. Loginov, The Economics of the Shipbuilding Industry of the USSR, Leningrad, 1939. R. Eval. RR 2.
4. Navy, ONI 217-C-48, 5 Jun 1948. C. Eval. B-2.
5. State, SDS 35, Sep 1946. S. Eval. RR 2.
6. State, SDS 544, Apr 1943. S. Eval. RR 2.
7. Comnavforger 307-S-49, 21 Jul 1949. S. Eval. RR 2.
8. , EUCOM, [illegible] 66-[illegible] 2 Feb 1950 S [illegible]
9. USNA, Moscow, Nov 1947. R. Eval. RR 2.
10. , EUCOM, RI [illegible]466-49, 2 F[illegible] 50 S. [illegible]
11. State, SDS 5, 1 Oct 1941. S. Eval. RR 2.
12. CIA SO, 16 Feb 1950. S. Eval. RR 2.
13. CIA, IR Consolidation No. 7008072. S, [illegible] OFFICIALS ONLY
14. State, SDS 5, op. cit.
15. Air, AISW 7050, 39979-10-2704-B, 10 Mar 1952. R. Eval. RR 3.
16. German Aerial Photography, dated Jun 1944, "Copycat" E 373. C.
17. CIA SO, 16 Feb 1950. S. Eval. RR 2.
18. Ibid.
19. CIA, IR Consolidation No. 7008072. S, [illegible]
20. State, SDS 5, op. cit.
21. CIA SO, 20 Mar 1952. C. Eval. F-3.
22. CIA SO, 22 Aug 1950. S, [illegible] Eval. RR 3.
23. Lloyd's Register of Shipping, 1951, Appendix. U. Eval. RR 2.
24. CIA SO, 20 Mar 1952. C. Eval. F-3.
25. CIA SO, 22 Aug 1950. S, [illegible] Eval. RR 3.
26. CIA SO, undated. S, [illegible] Eval. RR 2.
27. Ibid.
    State, SDS 35, op. cit.
28. S.P. Loginov, op. cit.
29. CIA SO, 22 Aug 1950. S, [illegible] Eval. RR 3.
30. Marinkalender, 1948, published in Sweden by Sveriges Flotta. U. Eval. RR 2.
31. S.P. Loginov, op. cit.
32. Air, USAF Treasure Island 0000347, 29 Jul 1952. R. Eval. RR 2.
33. State, SDS 2004, Mar 1941. C. Eval. RR 2.
34. State, SDS 5, op. cit.
35. Ibid.
36. [illegible] [illegible] [illegible] of the
    State, SDS 5, op. cit.
37. State, SDS 2004, op. cit.
38. Ibid.
39. State, SDS 5, op. cit.
40. Ibid.
41. Ibid.
42. S.P. Loginov, op. cit.
43. Air, AISS 7001, 27145-9-145, 14 Jul 1952. R. Eval. RR 2.

44. [illegible] Monthly [illegible] Aug --
45.
46.
47.
48. Navy, ONI FNVN 61, 26 Dec 1951. S, US OFFICIALS ONLY. Eval. RR 2.
49. Navy, ONI 62-S-51, 6 Jun 1951. S. Eval. B-2.
50. Ibid.
51. CIA SO, 22 Aug 1950. S, Eval. RR 3.
52. CIA SO, 18 Jan 1951. S, [illegible] ONLY. Eval. RR 3.
53. Air, USAFE, Report No. 49-17-508-1051, 22 Oct 1951. Eval. RR 3.
54. CIA SO, 26 Sep 1951. S, Eval. RR 3.
CIA SO, 22 Aug 1950. S, [illegible] ONLY. Eval. RR 3.
Air, AISW 7050, 47413-8-2278, 19 Jun 1951. R. Eval. RR 3.
55. Navy, ONI 62-S-51, 6 Jun 1951. S. Eval. B-2.
Navy, Atlantic Command, Weekly Intelligence Summary, 39-51, 27 Sep 1951. S, [illegible] ONLY Eval. RR 2.
56. Air, AISW 7050, 46348-4-3361, undated. R. Eval. RR 3.
57.
58.
59. Air, AISW 7050, 46348-4-3361, undated. R. Eval. RR 3.
60. Ibid.
61. Ibid.
62. Air, AISW 7050, 39979-10-2704-13, 3 Oct 1952. R. Eval. RR 3.
63. Air, AISS 7001, 27145-9-14[illegible] Jul 1952. R. Eval. RR 2.
64. Air, AISS 7001, T-000820-5-382, 13 Sep 1949. S. Eval. RR 3.
65. Air, AISS 7001, T-000703-7-24[illegible] Undated. S. Eval. RR 3.
66. CIA SO, 22 Aug 1950. S, Eval. RR 2.
67. State, SDS 5, op. cit.
68. NIS 26, Chapter VI, Section 64, Aug 1951. S. Eval. RR 3.
69. CIA, ORR Project 35-51 (WP), Input Requirements of the Submarine and Shipbuilding Industry of the USSR, 20 Feb 1953. S. Eval. RR 3.
70. Navy, ONI 52-850, 18 Sep 1952. S. Eval. RR 3.
71. Air, AISW 7050, 003600-1-1317-C, 13 Dec 1951. R. Eval. RR 2.
72. Federal Power Commission, Electric Power Requirements in the USSR, 1950, Part II, "Individual Grid Studies," 1952. S. Eval. RR 3.
73. CIA SO, 22 Aug 1950. S, Eval. RR 2.
74. Federal Power Commission, op. cit.
75. State, SDS 5, op. cit.
76. Federal Power Commission, op. cit.
77. Ibid.
78. Ibid.
79. State, SDS 5, op. cit.


LOCATION MAP
BLACK SEA
ORIENTATION MAP
NIKOLAYEV
YUZHNYY BUG
NIKOLAYEV
SHIPYARD NO. 444
IMENI A. MARTI
SECRET
Open Storage
Open Storage
Construction Shipping Pier
Building (reconstructed)
Building (probably reconstructed)
Boundary fence and gate
Railroad track
Crane track
Mobile tower hammerhead crane
Turntable
Probable Turntable


LOCATION MAP
BLACK SEA
ORIENTATION MAP
NIKOLAYEV
YUZHNYY BUG
Open Storage
Graving Dock
Shipping Pier
NIKOLAYEV
SHIPYARD NO. 444
IMENI A. MARTI
SECRET
Building (reconstructed)
Building (probably reconstructed)
Boundary fence and gate
Railroad track
Crane track
Mobile tower
Turntable
Probable Turntable